[10052/5901]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s)	:	Michael HACK et al.
Serial No.	:	10/020,336
Filed	:	December 12, 2001
For	:	INTELLIGENT MULTI-MEDIA DISPLAY COMMUNICATION SYSTEM
Examiner	:	Tu Nguyen
Art Unit	:	2684
Confirmation No.	:	1742

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

SECOND DECLARATION UNDER 37 C.F.R. § 1.131

S I R:

We, Michael Hack, Scott Seligsohn and Sherwin I. Seligsohn, declare and state as follows:

1. We are the named inventors of the above-captioned application.

2. We conceived of the subject matter described and claimed in the above-captioned application prior to September 7, 2001.

3. Attached hereto as Exhibit 1 is a copy of a document entitled "Confidential Invention Disclosure," which was prepared and submitted by at least one of us to patent counsel for Universal Display Corporation, the assignee of the entire right, title and interest in and to the above-captioned application, prior to September 7, 2001. Exhibit 1 has been partially redacted to remove certain date information.

4. Attached as Exhibit 2 is a copy of a document entitled "Intelligent Display Systems," which was prepared prior to September 7, 2001 based on information provided by at least one of us to patent counsel for Universal Display Corporation.

5. We exercised diligence in constructively reducing to practice the subject matter described and claimed in the above-captioned application from at least a time prior to September 7, 2001 continuously up to December 12, 2001, the date on which the above-captioned application was filed in the United States Patent and Trademark Office. During that time, we provided information to patent counsel for preparation of the above-captioned application and reviewed and revised drafts of the above-captioned application. Drafts of the above-captioned application were provided by patent counsel to at least one of us by at least correspondence dated October 29, 2001, November 9, 2001 and December 4, 2001.

6. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 35 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 3/22/05 Michael Hack

Date: 3/18/05 Scott Seligsohn

Date: 3/21/05 Sherwin I. Seligsohn

CONFIDENTIAL INVENTION DISCLOSURE

Universal Display Corporation

Please fill out this form as completely as possible. If more space is required, please attach additional sheets.

1. **TITLE:** [37 C.F.R. §1.71] (Try to be descriptive of the invention)

   3G WIRELESS OLED COMMUNICATION DEVICE

2. **ABSTRACT**: [37C.F.R. §1.72] Please provide a brief (less than one page) abstract of the invention. The purpose, as in scientific publications, is to provide a summary of the technical disclosure so that the reader can decide how to classify or index the document, or determine if he or she wishes to read the entire document. The Patent Office Rules provide that the Abstract will not be used to interpret the scope of the claims.

3. **TYPE OF INVENTION**: Please explain: Is the invention a new process, composition of matter, a device, or an improvement therein, including new uses for existing processes or devices, or all of the above?

The attached materials are submitted in behalf of Sherwin I. Seligsohn.

4. **SUBMISSION DATE:** [redacted]

   NAME OF PERSON SUBMITTING: [redacted]

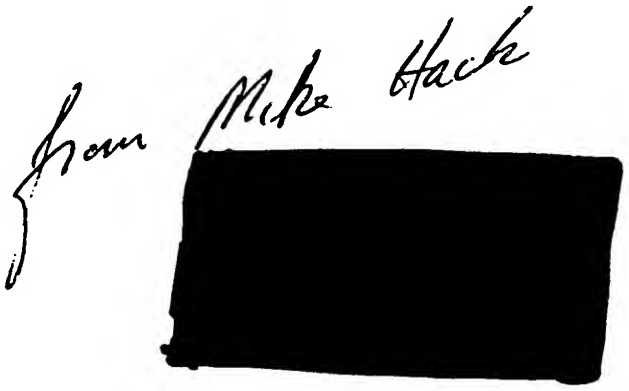
   SIGNATURE: [redacted]

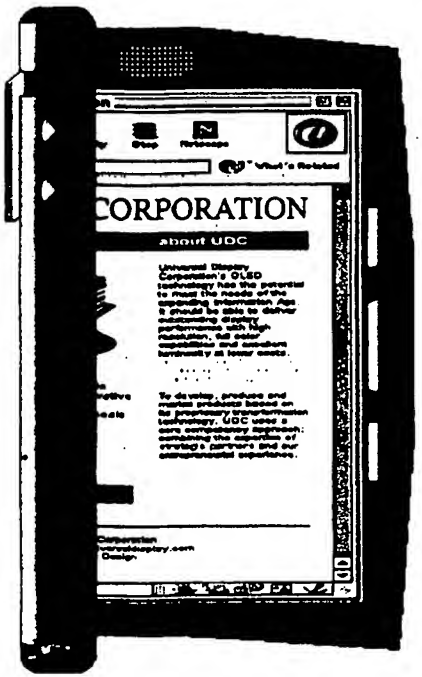
   SUBMITTED TO: [redacted]

This Invention Proposal relates to advanced communication devices that contain signal processing. One aspect of this invention is for "intelligent displays" that only require relatively low bandwidth communication with external systems. The display would contain many of the following features:

Embedded memory
Processing power
Connectivity to a network
Flexibility
Voice activation
High efficiency
Automatic compatibility with external media
Intelligence
On-board power source
Low bandwidth data source.
Self-configurability

The basic idea is that the display contains intelligence that enables it to configure its function according to its environment. The use of bistable pixels would minimize the data transmission rate between the display and its controlling system. While many of the above features have been described previously, our invention relates to combining many or all of these features into one system.

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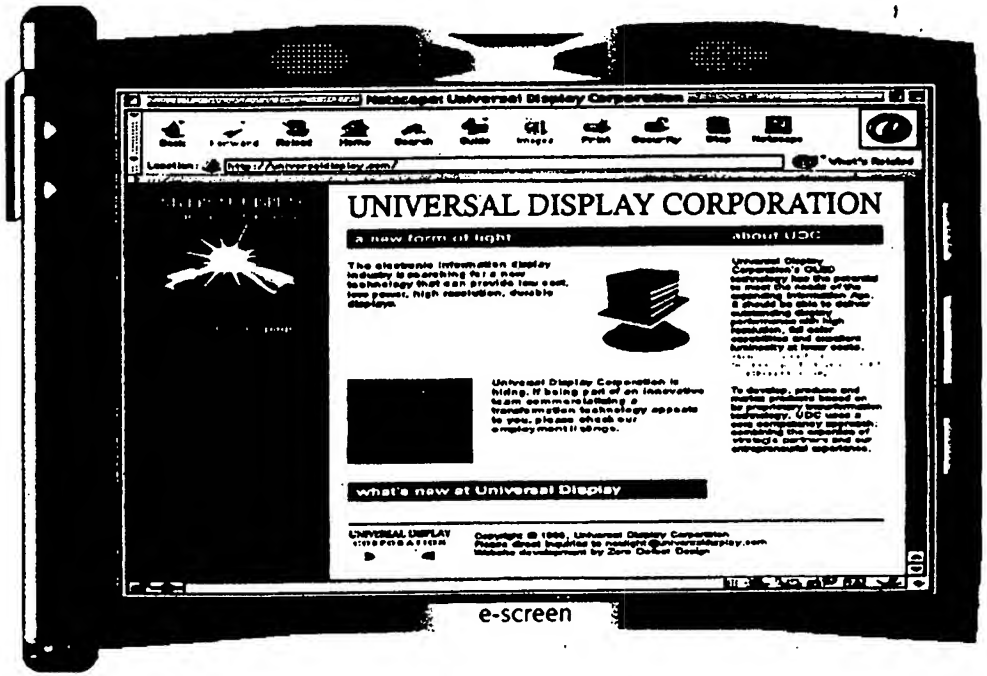
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INTELLIGENT DISPLAY SYSTEMS

In general, the concept of an intelligent display system represents a paradigm shift from the display as support for the computer to the computer as support for the display. The display is, after all, the component of the system that the user actually sees. That is, from the user's point of view, the display *is* the system.

It is envisioned that intelligent display systems could be used in connection with PDAs, cell phones, VDTs, movie screens, and the like. Just about any system having a display of any kind could be converted into a system having an intelligent display. There are even some futuristic applications for such technology, such as the use of an aerosol can, or the like, to "spray" intelligent display particles onto a substrate, such as a wall, or board, or clothing, for example. The display particles would connect with their neighbors and become a working display. One concept is a flexible or "roll-out" display, such as the display "pen" that was presented to DARPA, and is provided on DARPA's and UDC's web sites. To the extent that intelligent displays can be made to operate using low bandwidth communications, they would be better, but such a limitation is unnecessary as far as the invention is concerned.

An intelligent display can include any or all of the following elements, working in combination.

Embedded memory: An intelligent display should include embedded memory either in the display itself or at the local level of the system. Embedded memory can reduce the bandwidth requirement between the display and the outside world by passing only information that updates the display. Consequently, the display must have memory to retain information as to what the previous image was. Also, each pixel would need to know where it is relative to other pixels in display. Unique addressing codes could be provided so that each pixel would know what it is supposed to display.

There could be memory in each pixel or in a system level device that is external to the display. Basic memory cells, such as a few transistors, could be used. It might be advantageous to use a few transistors at each pixel to reduce or eliminate the need to keep moving information from the outside to the pixel. Alternatively, an external chip could be used to make it easy for pixel memories to talk to one another. The memory could be implemented as a large area electronic backplane, such as an active matrix display. For example, a pixel matrix could be overlaid on a backplane such that a number of transistors would be associated with each pixel.

Currently, the backplane is built first, and then OLEDs are deposited onto it. Typically, the backplane includes electronics. In an intelligent display system, additional electronics could be added for pixel-specific memory. A pixel can be defined as one or more OLEDs with local processing power attached. OLEDs, because they are natural and highly efficient, are ideal for such a display.

Processing power: An intelligent display system can use an external chip for processing, or processing power could be provided locally in each pixel. Currently, external chips view the display as a grid having a number of rows and columns. In an intelligent display system, an

external chip could be used to compare the most recently received image (to be displayed) with the previously received image (which is currently being displayed). The external chip could address individual pixels and tell them what to display. Alternatively, the processing could be local to each pixel. For example, in a system wherein the display is updated rather than provided with a whole new image, information can come into the display and tell each pixel what to update. It is conceivable that higher level information is sent to each pixel, and the pixel can do some calculations to determine what it has to display.

Connectivity to a network: An intelligent display is not isolated. That is, it can communicate directly with the outside world via a wireless connection, for example.

Flexibility: Currently, because displays are perceived as grids of rows and columns, rectangular displays are prevalent. An intelligent display, however, can have an unconstrained form factor. It is not necessarily rigid. The substrate onto which an intelligent display is formed can take on any shape.

Voice activation: Consistent with the paradigm that the intelligent display is the computer, the user should be able to command the intelligent display to display what the user wants to see. For example, the user could request that the display show the user's emails or, more narrowly, show emails that the user received on a certain date. The display should be able to zoom in or out, connect to a Web site, retrieve Web-based information (such as flight information, for example), and the like, all based on voice commands.

Energy efficiency: An intelligent display should be a high efficiency system. That is, the display should have as high a brightness with as little power consumption as possible. It is, of course, desirable for the battery to be as small and long lasting as possible. OLEDs, therefore, are a logical choice, and UDC's OLEDs are the most suitable because of their high efficiency.

Automatic compatibility with external media: An intelligent display knows how to connect to any number of external devices. The display knows what external device is communicating with it, what external device it is communicating with. The display can act accordingly. For example, the user of an intelligent display system can connect to his cell phone and the intelligent display will thereafter mimic the cell phone display (or laptop, or server, etc) and, in many cases, provide a better display than the external device.

Low bandwidth data source: In an intelligent display system, the protocol for communications between the display and the outside world significantly reduces the required communications bandwidth relative to current communications protocols. For example, in an intelligent display system, there is no need to transmit information for every pixel. Each pixel, being intelligent, can determine what it is expected to display based on higher level information that is provided via the communications from the outside world. Additionally, only that which needs updating should be updated. For backward compatibility, however, an intelligent display system should be able to operate using old (existing) protocols (*i.e.*, to translate from the old protocol to the new).

Self-configurability: Self-configurability comes in two flavors. First, as in the aerosol spray example, each pixel (or, more generally, sub-display) can configure itself to become part of a bigger display. In such an application, each pixel knows what its role is, and it thereafter acts accordingly.

An intelligent display can be self-configurable in another way, as well. For example, a sub-display might be made up of a 4x4 array of bistable pixels (bistable pixels stay in their current state until told to change). In one configuration, the sub-display might change grayscale by changing the number of the 16 pixels that are on (or off) at a given time. The display can reconfigure itself as a matter of grayscale versus resolution based on to the needs of the image to be displayed. That is, the sub-display can reconfigure itself, based on whether a more precise grayscale or more resolution is desired for the current display. For example, four gray levels might be adequate but more resolution is desirable. In such an application, the 4x4 sub-display could reconfigure itself as four 2x2 sub-displays, each having four gray levels. Similarly, four 4x4 sub-displays could work together to form an 8x8 display having less resolution, but 64 gray levels.